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UNITED STATES DEPARTMENT OF AGRICULTURE
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WASHINGTON, D.C.

UNITED STATES
STANDARDS
for grades of
FROZEN
CONCENTRATED
GRAPEFRUIT JUICE



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EFFECTIVE OCTOBER 1, 1970

Third Issue

These standards supersede the standards
which have been in effect since
September 21, 1968

This third issue of the United States Standards for Grades of Frozen Concentrated Grapefruit Juice provides for the use of either white or red pigmented grapefruit in its preparation (35 F.R. 13822).

These standards were published in the Federal Register on November 28, 1956 (21 F.R. 9284) to become effective on December 28, 1956. Section 52.1231 was amended (22 F.R. 3535) to cite the Regulations Governing Inspection and Certification for ascertaining the grade of a lot, effective July 1, 1957.

The standards as amended in 1968 (33 F.R. 11881, August 22, 1968) raise the oil limits (Section 52.1229) and change the method for the determination of recoverable oil (Section 52.1230).

This grade standard is issued under authority of the Agricultural Marketing Act of 1946 which provides for the issuance of official U.S. grades to designate different levels of quality for the voluntary use of producers, buyers, and consumers. Official grading service is also provided under this Act upon request of the applicant and upon payment of a fee to cover the cost of the service.

As is the case of other standards for processed fruits and vegetables, these standards are designed to serve as a convenient basis for sales, for establishing quality control programs, and for determining loan values. They will also serve as a basis for the inspection of this commodity by Federal inspection service, which is available for the inspection of other processed products as well.

These standards are issued by the Department after careful consideration of all data and views submitted and the Department welcomes suggestions which might aid in improving these standards in future revisions. Comments may be submitted to, and copies of these standards obtained from:

Chief, Processed Products Standardization and Inspection Branch
Fruit and Vegetable Division, C&MS
U.S. Department of Agriculture
Washington, D. C. 20250

UNITED STATES STANDARDS FOR GRADES OF FROZEN CONCENTRATED GRAPEFRUIT JUICE

Effective October 1, 1970

PRODUCT DESCRIPTION, STYLES, AND GRADES

Sec.

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- 52.1230 Explanations and methods of analysis.

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- 52.1231 Ascertaining the grade of a lot.

SCORE SHEET

- 52.1232 Score sheet for frozen concentrated grapefruit juice.

AUTHORITY: Sections 52.1221 to 52.1232 issued under secs. 202-208, 60 Stat. 1087, as amended; 7 U.S.C. 1621-1627.

PRODUCT DESCRIPTION, STYLES, AND GRADES

§ 52.1221 Product description.

Frozen concentrated grapefruit juice is the product obtained from the unfermented juice of sound, mature grapefruit (*Citrus paradisi*). The fruit is prepared by sorting and by washing to assure a clean and wholesome product.

NOTE:

Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act or with applicable State laws and regulations.

Upon extraction of such juice, it is concentrated and single-strength grapefruit juice may be admixed to the concentrate. The concentrated grapefruit juice is packed in accordance with good commercial practice and is frozen and maintained at temperatures necessary for its preservation.

§ 52.1222 Styles.

(a) *Unsweetened*. The Brix value of the finished concentrate is not less than 38 degrees nor more than 42 degrees.

(b) *Sweetened*. The Brix value of the finished, sweetened, concentrate is not less than 38 degrees nor more than 48 degrees. Frozen concentrated grapefruit juice of this style contains not less than 3.47 pounds of soluble grapefruit solids per gallon.

§ 52.1223 Grades.

(a) "U.S. Grade A" (or "U.S. Fancy") is the quality of frozen concentrated grapefruit juice which reconstitutes properly and of which the reconstituted juice possesses the appearance of fresh grapefruit juice; possesses a very good color; is practically free from defects; possesses a very good flavor; and scores not less than 90 points when scored in accordance with the scoring system outlined in this subpart.

(b) "U.S. Grade B" (or "U.S. Choice") is the quality of frozen concentrated grapefruit juice which reconstitutes properly and of which the reconstituted juice possesses a good color; is reasonably free from defects; possesses a good flavor; and scores not less than 80 points when scored in accordance with the scoring system outlined in this subpart.

(c) "Substandard" is the quality of frozen concentrated grapefruit juice

that fails to meet the requirements of U.S. Grade B.

FILL OF CONTAINER

§ 52.1224 Recommended fill of container.

The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purposes of these grades. It is recommended that each container be as full of frozen concentrated grapefruit juice as practicable without impairment of quality.

FACTORS OF QUALITY

§ 52.1225 Ascertaining the grade of a sample unit.

In addition to considering other requirements outlined in the standards the following quality factors are evaluated:

(a) *Factors not rated by score points.*

(1) Faculty of reconstituting properly.

(2) Appearance of fresh juice.

(b) *Factors rated by score points.* The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors:	Points
Color -----	40
Defects -----	20
Flavor -----	40
Total score-----	100

§ 52.1226 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive. (For example, "18 to 20 points" means 18, 19, or 20 points.)

§ 52.1227 Color.

(a) (A) *Classification.* Frozen concentrated grapefruit juice of which the reconstituted juice possesses a very good color may be given a score of 36 to 40

points. "Very good color" means a color that is bright and typical of freshly extracted grapefruit juice. It may be either:

(1) Pale yellow to very slightly amber, typical of the juice of properly ripened white fleshed grapefruit, or

(2) Slightly red, typical of the juice of red or deep pink fleshed grapefruit.

(b) (B) *Classification.* If the reconstituted juice possesses a "good color" a score of 32 to 35 points may be given. Frozen concentrated grapefruit juice that falls into this classification shall not be graded above U.S. Grade B regardless of the total score for the product (this is a limiting rule), "Good color" means a color that is typical of freshly extracted grapefruit juice but which may be slightly dull, or slightly brown as caused by scorching, oxidation, or caramelization. This color may be characteristic of the juice from red or pink grapefruit of advanced maturity, or of mixtures of the juice from white and colored varieties.

(c) (SStd) *Classification.* If the reconstituted juice fails to meet the requirements of U.S. Grade B for the factor of color, a score of 0 to 31 points may be given. Frozen concentrated grapefruit juice that falls into this classification shall not be graded above Substandard regardless of the total score for the product (this is a limiting rule).

§ 52.1228 Defects.

(a) *General.* The factor of defects refers to the degree of freedom from juice cells and pulp and from seeds or portions thereof, dark specks, and other defects in the reconstituted juice.

(b) (A) *Classification.* Frozen concentrated grapefruit juice of which the reconstituted juice is practically free from defects may be given a score of 18 to 20 points. "Practically free from defects" means that there may be present:

(1) Juice cells only in such amounts as do not materially detract from the appearance or drinking quality of the juice;

(2) Not more than 10 percent free and suspended pulp;

(3) Practically no seeds or portions thereof that could not pass readily

through round perforations of one-eighth inch in diameter;

(4) Only such small seeds or portions thereof that could pass through round perforations of one-eighth inch in diameter as do not materially detract from the appearance or drinking quality of the juice; and

(5) Other defects that are not more than slightly objectionable.

(c) (B) *Classification.* If the reconstituted juice is reasonably free from defects a score of 16 to 17 points may be given. Frozen concentrated grapefruit juice that falls into this classification shall not be graded above U.S. Grade B regardless of the total score for the product (this is a limiting rule). "Reasonably free from defects" means that there may be present:

(1) Juice cells only in such amounts as do not seriously detract from the appearance or drinking quality of the juice;

(2) Not more than 10 percent free and suspended pulp;

(3) Practically no seeds or portions thereof that could not pass readily through round perforations of one-eighth inch in diameter;

(4) Only such small seeds or portions thereof that could pass through round perforations of one-eighth inch in diameter as do not seriously detract from the appearance or drinking quality of the juice; and

(5) Other defects that are not materially objectionable.

(d) (SStd.) *Classifications.* Frozen concentrated grapefruit juice that fails to meet the requirements of U.S. Grade B for the factor of defects may be given a score of 0 to 15 points and shall not be graded above Substandard regardless of the total score for the product (this is a limiting rule).

§ 52.1229 Flavor.

(a) (A) *Classification.* Frozen concentrated grapefruit juice of which the reconstituted juice possesses a very good flavor may be given a score of 36 to 40 points. "Very good flavor" means that the flavor is fine, distinct, and substantially typical of freshly extracted grapefruit juice with not more than a trace of bit-

terness. To score in this classification frozen concentrated grapefruit juice shall meet the following analytical requirements:

ANALYTICAL REQUIREMENTS—U.S. GRADE A

	Unsweetened style	Sweetened style
<i>Ratio—Brix Value to Acid</i>		
Minimum.....	9:1	10:1
Maximum.....	14:1	13:1
<i>Recoverable oil—Percent by volume</i> (Reconstituted juice)		
Minimum.....	0.008	0.008
Maximum.....	0.020	0.020

(b) (B) *Classification.* If the reconstituted juice possesses a good flavor a score of 32 to 35 points may be given. Frozen concentrated grapefruit juice that falls into this classification shall not be graded above U.S. Grade B regardless of the total score for the product (this is a limiting rule). "Good Flavor" means that the flavor is fairly typical of freshly extracted grapefruit juice and is free from abnormal flavors and off flavors of any kind. To score in this classification frozen concentrated grapefruit juice shall meet the following analytical requirements:

ANALYTICAL REQUIREMENTS—U.S. GRADE B

	Unsweetened style	Sweetened style
<i>Ratio—Brix Value to Acid</i>		
Minimum.....	7:1	8:1
Maximum.....	16:1	13:1
<i>Recoverable oil—Percent volume</i> (Reconstituted juice)		
Maximum.....	0.020	0.020

(c) (SStd.) *Classification.* If the frozen concentrated grapefruit juice fails to meet the requirements of U.S. Grade B for the factor of flavor a score of 0 to 31 points may be given. Frozen concentrated grapefruit juice that falls into this classification shall not be graded above Substandard regardless of the total score for the product (this is a limiting rule).

EXPLANATIONS AND METHODS OF
ANALYSIS

§ 52.1230 Definitions of terms as used in these standards, and methods of analysis.

(a) *Reconstituted juice.* "Reconstituted juice" means the product obtained by mixing thoroughly 3 parts by volume of distilled water and one part by volume of frozen concentrated grapefruit juice.

(b) *Reconstitutes properly.* "Reconstitutes properly" means that the concentrate goes into solution readily; and that in approximately 250 ml. of the reconstituted juice, after standing four (4) hours at a temperature of not less than 68° Fahrenheit in a clear glass cylinder (approximately 1 1/4 inches in diameter), there may be a noticeable separation of suspended matter but any resulting zone of greater clarity shall be definitely turbid and not clear or transparent.

(c) *Acid.* "Acid" means the percent by weight of total acidity, calculated as anhydrous citric acid. Total acidity is determined by titration with standard sodium hydroxide solution, using phenolphthalein as indicator.

(d) *Brix value.* "Brix value" is the refractometric sucrose value determined on the thawed concentrate in accordance with the refractometric method for sugars and sugar products, outlined in the "Official Methods of Analysis of the Association of Official Analytical Chemists" and to which the applicable correction for acid is added:

TABLE I—CORRECTIONS FOR OBTAINING BRIX VALUE¹

Citric acid, anhydrous (percent by weight):	Correction to be added to refrac- tometer sucrose value to ob- tain degree Brix value
2.0	0.39
2.2	.43
2.4	.47
2.6	.51
2.8	.54
3.0	.58
3.2	.62
3.4	.66
3.6	.70
3.8	.74
4.0	.78
4.2	.81
4.4	.85
4.6	.89
4.8	.93
5.0	.97

¹ SOURCE: "Refractometric Determination of Soluble Solids in Citrus Juices," by J. W. Stevens and W. E. Baier, from the Analytical Edition of Industrial and Engineering Chemistry, Vol. II, p. 447, Aug. 15, 1939.

(e) *Recoverable oil.* "Recoverable Oil" is determined by the following method:

METHOD

(1) Reagents.

Standard bromide-bromate solution—prepare and standardized to 0.099N in accordance with Chapter 42, Standard Solutions in the current edition of the AOAC.¹ For use, add 1 volume of standard solution to 3 volumes of water to make 0.0247N solution. 1 ml. of 0.0247N solution supplies bromine to react with 0.00085g., or 0.0010 ml., of d-limonene. The solutions are stable for 6 months.

2-Propanol—Regent grade ACS (American Chemical Society).

Dilute hydrochloric acid—prepared by adding 1 volume of concentrated acid to 2 volumes of water.

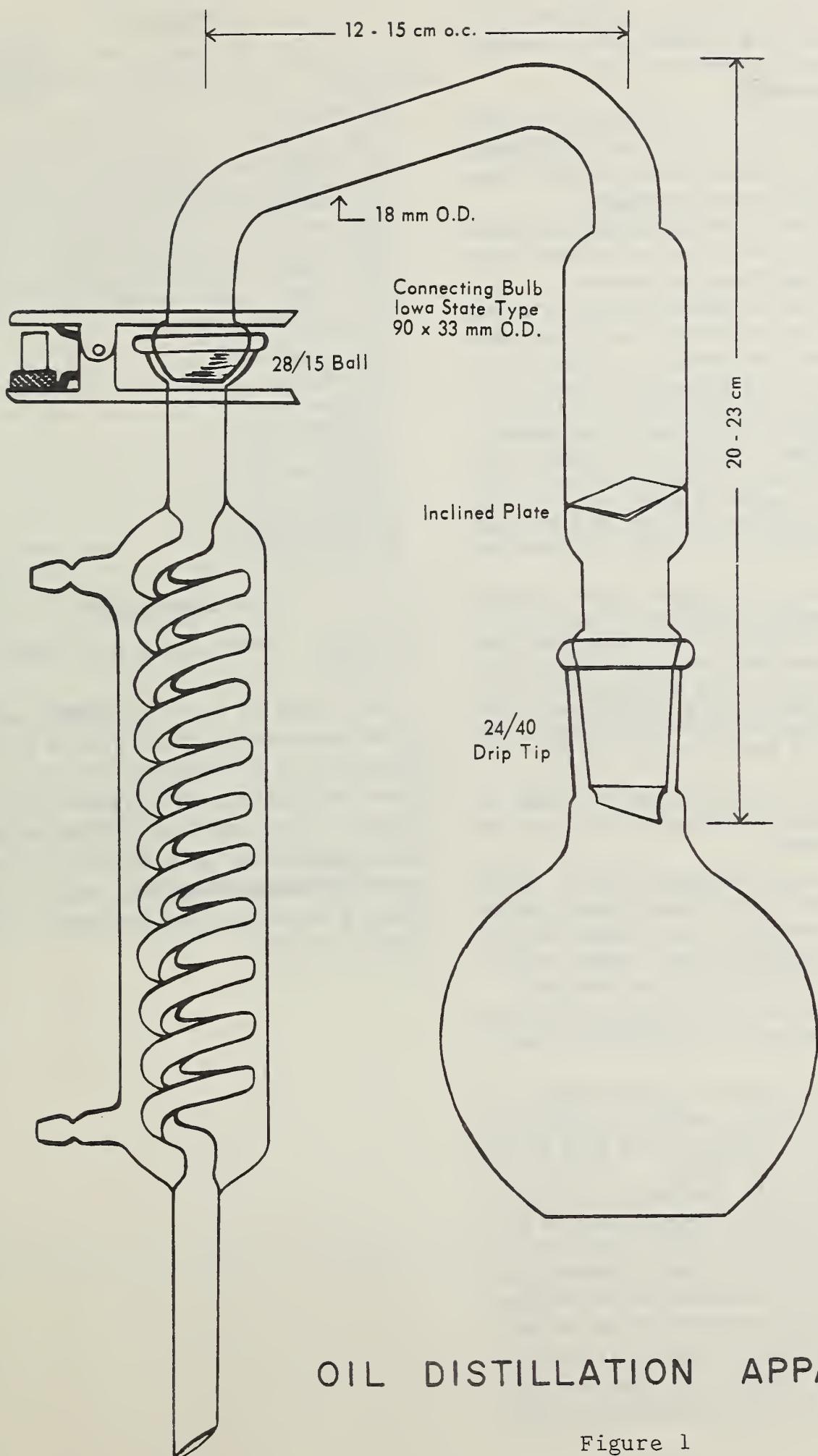
Methyl orange indicator—0.1 percent in water.

(2) Apparatus.

Electric heater—with recessed refractory top, 500–750 watts.

Still, all glass—500 ml. distillation flask with 24/40 standard taper neck; 200-mm. Graham condenser with 28/15 receiving socket and drip tip; connecting bulb and adaptor as in figure 1.

¹ "AOAC" refers to the Official Methods of Analysis published by the Association of Official Analytical (formerly Agricultural) Chemists. Copies may be obtained from this Association at Box 540, Benjamin Franklin Station, Washington, D.C. 20044.



OIL DISTILLATION APPARATUS

Figure 1

Burette—10 ml. or 25 ml.; graduated to 0.1 ml., with easily controllable flow to permit both rapid and dropwise titration.

(3) Determination.

(i) Pipette 25 ml. of well-mixed sample (reconstituted juice) into the distillation flask containing carborundum chips or glass beads, and add 25 ml. of 2-Propanol.

(ii) Distill into a 150 ml. beaker. Continue distilling until solvent ceases to reflux then remove the flask from the heater.

(iii) Add 10 ml. of dilute hydrochloric acid and 1 drop of indicator. (An alternative method would be to prepare a solution containing 5 ml. of indicator and 1,000 ml. of dilute hydrochloric acid—then add 10 ml. of this acid-indicator mix to the 150 ml. beaker.)

(iv) Titrate with the dilute bromate solution while stirring. The major portion of the titrant may be added rapidly, but the endpoint must be approached at about 1 drop per second. Disappearance of color indicates the endpoint.

(v) Determine the reagent blank by titrating three separate mixtures of 25 ml. 2-Propanol and 10 ml. of dilute hydrochloric acid with indicator—without refilling the burette. Divide the total milliliter of titrant used by 3 to obtain the average blank. Subtract the average blank thus obtained from the milliliter of titrant used to titrate the distillate.

(vi) Multiply the remainder by 0.004 to obtain the percent recoverable oil by volume in the juice sample.

(f) *Free and suspended pulp.* "Free and suspended pulp" means particles of membrane, core, peel, and other similar extraneous material that settle out on centrifuging by the following method:

(1) Skim floating fruit cells and pulp from the sample of reconstituted juice, and

(2) Fill graduated centrifuge tubes, of a capacity of 50 ml., with the skimmed reconstituted grapefruit juice and place in a suitable centrifuge. Adjust the speed according to diameter, as indicated in table II, and centrifuge for exactly 10 minutes. As used herein, "diameter" means the overall distance between the bottoms of opposing centrifuge tubes in operating position. After centrifuging, the milliliter reading at the top of the layer of pulp in the tube is multiplied by 2 to give the percentage of pulp.

TABLE II

Diameter:	Approximate revolutions per Minute
10 inches	1, 609
10½ inches	1, 570
11 inches	1, 534
11½ inches	1, 500
12 inches	1, 468
12½ inches	1, 438
13 inches	1, 410
13½ inches	1, 384
14 inches	1, 359
14½ inches	1, 336
15 inches	1, 313
15½ inches	1, 292
16 inches	1, 271
16½ inches	1, 252
17 inches	1, 234
17½ inches	1, 216
18 inches	1, 199
18½ inches	1, 182
19 inches	1, 167
19½ inches	1, 152
20 inches	1, 137

LOT COMPLIANCE

§ 52.1231 Ascertaining the grade of a lot.

The grade of a lot of frozen concentrated grapefruit juice covered by these standards is determined by the procedures set forth in the Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products (§§ 52.1 through 52.87).

SCORE SHEET

§ 52.1232 Score sheet for frozen concentrated grapefruit juice.

Size and kind of container.....	.....
Container mark or identification.....	.....
Label.....	.....
Liquid measure (fluid ounces).....	.....
Brix value of concentrate (corrected for acid).....	.....
Anhydrous citric acid (percent by weight).....	.....
Brix value to acid ratio (-:1).....	.....
Recoverable oil (percent by volume).....	.....
Free and suspended pulp (percent).....	.....
Reconstitutes properly (Yes) (No).....	.....
Appearance of fresh juice (Yes) (No).....	.....

Factors	Score points
Color.....	40
	40 | { (A) 36-40 | (B) 132-35 | (SStd.) 10-31
Defects.....	20
	20 | { (A) 18-20 | (B) 116-17 | (SStd.) 10-15
Flavor.....	40
	40 | { (A) 36-40 | (B) 132-35 | (SStd.) 10-31
Total score.....	100
Grade.....	.....

¹ Indicates limiting rule.

Dated: August 26, 1970.

G. R. GRANGE,
Acting Administrator.

